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SPECIAL ACCESS CODES

Special Access Codes (SACs) are three digit codes that allow carriers and subscribers to enter into uniform billing arrangements under which either the caller or the called party pay for calls. Before SACs were available, toll call scenarios (dialing 1 + 10 digits) required the caller to pay for all charges associated with the completion of the call. SACs were created to allow the called party to pay the charges and thereby offer toll-free service to the caller. For the purposes of this report, only the called party pays (or toll-free) uses of SACs will be discussed.

Currently, 800 is the only SAC available to subscribers for toll-free calling. The Industry Numbering Committee (INC), under the auspices of the Industry Carrier Compatibility Forum (ICCF), assigned 888 as the next toll free SAC to provide relief for the 800 number resource, which is expected to be depleted by early 1996. In anticipation of future demand, INC also reserved the numbers 877, 866, 855, 844, 833, and 822 as additional toll free SACs. The designation of a toll free SAC is purely a marketing arrangement; there are no longer any technical requirements restricting the INC from choosing any area code configuration as an SAC. The seven codes referred to above that the INC has currently assigned for toll-free growth, to increase the capacity beyond the 800 resource, contain approximately 56 million individual assignable numbers. (This excludes the 16 million additional numbers that could be made available if the 8XX-100 and 8XX-000 series were able to be assigned.)

CURRENT DIALING ARRANGEMENTS FOR PAGING CARRIERS

Paging carriers currently are able to offer non-geographic numbers to their customers via two possible dialing arrangements within a toll-free SAC. Both methods of accessing messaging services via toll-free numbers maintain the called party pays billing arrangement.

Under the Direct Inward Dialing (DID) method, customers can access toll-free messaging services by dialing eleven (1 + 10) digits. The second method of accessing messaging services on a toll free basis requires the customer to dial eleven digits, and then to wait for the messaging service to answer, at which point the customer is then asked (typically by a recorded announcement) to enter a Personal Identification Number (PIN), in order to be connected to the desired service. Currently, there are no technical standards for PIN interconnections other than LEC tariffs for permissible subscriber connections. For the purposes of this report, 7 digit PINs will be assumed. Under this assumption, with PIN technology, a total of 18 dialed digits is required to set up a call to a paging subscriber.

The paging industry currently uses both DID and PIN arrangements for subscriber paging applications. The paging subscriber's specific communications needs and the paging carrier's business decisions determine whether DID and/or PIN interconnection is available to subscribers. As set forth below, DID numbers are essential or preferred in most applications because they allow subscribers (and the serving carrier) to benefit from SS7 services, are accessible even from rotary phones without operator intervention, and allow callers to retain the "ease of use" associated with other calls over the public network.

THE PAGING INDUSTRY – UTILIZATION OF 800 NUMBERS

Toll free 800 DID numbers are very attractive business tools that allow business and consumers to be reached anywhere, any time on a toll free basis, thus allowing them considerable flexibility in meeting their own business and consumer needs. Interexchange Carriers (IXCs), Local Exchange Carriers (LECs) and the paging industry have responded to the demands of their customers, in particular in the business environment, with a myriad of services using 800 numbers. Traveling subscribers are no longer tied to geographic area codes, and can offer their own customers the ease of communications (including paging) via a toll-free number. Although all customers of the telecommunications world have benefitted from the use of 800-type numbers, this report will concentrate on the specific needs of the paging industry.

PCIA estimates, based on conversations with its members, that the paging industry only accounts for a maximum of 500,000 of all 800 numbers, the bulk of which appear to be utilized on a DID basis. This total represents only 7% of the total 7.1 million 800 numbers assigned, although many wireline customers forward their business and/or residential 800 numbers to a paging device. Even including paging services that are forwarded from business or residential 800 numbers, however, paging providers currently are responsible for only a fraction of total existing 800 number use. Because of the many additional services that are rapidly becoming available, PCIA anticipates that the demand by paging for access to toll free SAC codes will continue to grow rapidly.

As shown below, 800 numbers provide PSTN access to a great variety of “paging” communications services:

Current Paging Services Accessed by 800 Numbers

Numeric Display Paging
Alphanumeric Paging
Alphanumeric Paging with Voice Mail
Alphanumeric Paging with Data
Alphanumeric with FAX
Voice Mail
Voice Mail with Numeric Display Paging

Voice Mail with Alphanumeric Display Paging
Voice Paging
Voice Paging with Voice Mail
Data

As noted, PSTN originated messages destined for "paging" numbers include voice, numeric, alphanumeric, text data and image data. It is not possible to adequately interconnect most of this traffic to the paging systems using subscriber level PIN connections. The following service features require a DID interconnection:

- 11 Digit access
- Forwarded Call capability
- Rotary Dial Telephone access
- FAX capability
- Automatic (Rotary) Retrieve of Voice Mail
- Announcement services
- Any services that are used in "public" applications.

In general, paging services that are used by business, public safety, government or other agencies must have general public access capability using a standard 11 digit NANP number. One would not expect to see a PIN number listed on a billboard or in a telephone directory, and a PIN access arrangement is unusable for any business that competes with other businesses that use standard 7 or 11 digit NANP numbers. Currently, many "personal" 800 numbers are used to provide very innovative services such as ordering movies on cable TV, personal FAX storage, school closing announcements, weather and sports information, stock market news, restaurant listings, long distance calling cards, private residential, etc.

DIRECT INWARD DIALING IN THE SS7 ENVIRONMENT**Advantages of SS7 Technology**

The telecommunications industry is in the process of expanding the traffic capacity and routing capabilities of the Public Switched Telephone Network (PSTN) through the deployment of Signaling System 7 (SS7) technology. SS7 in its most generic form is defined as a call-setup signaling format, transmitted over a data circuit separate from the voice path. SS7 technology also allows the introduction of Advanced Intelligent Network (AIN) services. See figure 1 for a comparison of conventional PSTN and SS7 networks.

SS7 is configured as a data network overlay to the existing PSTN. Using the SS7 network for administrative functions has increased the overall efficiency of the voice network by 10% to 15%. Administrative functions include the monitoring and supervision of the dialed number, answer supervision, call termination, etc. Trunking efficiencies are gained when the data network establishes contact with the distant-end switch prior to connecting the voice circuit. The use of voice circuits for trunk signaling, which is required for PIN paging, is a costly and inefficient interconnection that is many times slower than the high-speed SS7 data network. By identifying the availability and call routing prior to establishing the voice circuit, the use of SS7 for paging interconnection saves trunk costs and capacity normally used on busy or invalid calls.

Importantly, the migration of paging interconnections to SS7 also sets the stage for the introduction of AIN services. The AIN services will incorporate customer database information allowing the public to fully integrate all of their telecommunications services and control call routing. The customers using AIN services will have added ability to screen or block calls, routing enhancements based on time-of-day and/or day-of-week, and customized services to best meet their individual needs.

The benefits of trunking efficiency and enhanced AIN services are derived from the delivery of the Calling Number Identification (CNID) prior to the call set up. The CNID is the

subscriber's unique network address. The format of the CNID, as defined by the industry, is NPA-NXX-XXXX (I.E. a 10-digit DID number.)

SS7 Technology Cannot Be Used with PIN Arrangements

SS7 based services, however, cannot be used with PIN calling arrangements because PIN systems require that each "address" or subscriber in the system have a unique PIN number in addition to a common shared 10 digit PSTN number. In effect, this means that each PIN subscriber (assuming 7 digit PINs are assigned) would have an 18 digit telephone number. The SS7 network, in contrast, is designed only to work with a maximum 10 digit number.

For example, a call to a number utilizing a PIN arrangement requires that the caller first dial the 10 digit PSTN access number and wait for the call to "complete." All PSTN and SS7 network functions are also "completed" to the 10 digit access number at this time. However, the caller accessing a number utilizing a PIN arrangement also must dial the PIN number that defines the subscriber's "address". Without the subscriber's "address" or PIN number, the called number information necessary to do a database lookup function does not exist. As a result, a PIN paging arrangement would preclude a paging subscriber from: (1) forwarding calls intended for their pager number; (2) forwarding calls that originated from a predesignated NANP number; or (3) forwarding calls to some other NANP location. This is because the caller cannot dial the PIN number until after the call "completes" to the common access number. The called system cannot use or receive AIN functions after the caller dials a PIN number. Alternatively, a call to a 10 digit DID number directly defines the NANP "address" and can be instantly sent by the SS7 network to be used for the database lookup of information necessary for the AIN functions.

The following list of AIN services are only available with DID arrangements that use SS7 technology:

Anywhere call pick-up
Call Volume Distribution
Do-not-disturb

Calling Name Delivery
Customized Intercept
Flexible call forwarding

Calling Name on call waiting
Data Security
Follow me service

Interactive Response Unit
Single number calling
Remind me Service
Personal Communications Services

Local Polling
Voice activated dialing
Message T & R Service

Network ACD
Wake up Service

The current AIN switching standards have not defined any AIN service to accommodate the PIN dialing arrangement. If customers using toll-free numbers to access their pagers are forced to use PIN arrangements, they will not have any of the above list of services available to them. Paging carriers mandated to provide only PIN arrangement for toll-free services, will be forced to stop abruptly the natural evolution to advanced technologies.

* * * * *

Subsequent sections discuss examples of some messaging services and the problems associated with required PIN technology deployment. These examples are intended to highlight the technical issues in an understandable fashion.

A popular feature offered by voice mail service providers and PBX equipment suppliers is outbound notification to a pager upon receipt of a voice mail message. See figure 2. Under this service, when a caller leaves a message on a subscriber's voice mail, the voice mail system is preprogrammed to dial an eleven digit paging number followed by an optional second specified (preprogrammed) number. The subscriber is thus notified that he has a voice mail message. The second level of preprogrammed numbers can be the called party's extension number, a set code which holds special meaning for the paged subscriber, or the office number. Some companies use this feature to better educate the paged subscriber. For example, a company may choose to send a "911" for voice mails that are marked urgent, or "411" for informational non-urgent messages. This feature is available as a DID arrangement only. The second preprogrammed number required for this service cannot be used reliably with systems utilizing PIN technology because of the lack of industry standards that define timing and call processing procedures in PSTN switches. In addition, voice mail systems and PBXs are generally not equipped to handle calls to PIN paging arrangements because these systems have very limited capabilities for an expanded numbering plan that requires multiple dialing sequences. Voice mail and PBX systems would require extensive hardware and software modifications to call numbers that go beyond the standard NANP 10 digit format.

Furthermore, voice mail services that are used to terminate calls forwarded from other locations in the PSTN cannot be used with PIN arrangements for three reasons. First, under PIN arrangements, the caller will be connected to the 800 access number and not to the desired voice mail box. In forwarding situations, even if economically viable, manual operator assistance is not feasible because the caller may not be aware of the paging subscriber's identity. In addition, most PIN paging in use today does not provide any operator default. Second, the caller may not be at a touch tone telephone. PIN arrangements require the use of touch tone telephones. Finally, the caller is not likely to know the required PIN number. In contrast, calls made under DID arrangements can be easily

forwarded to a DID 800 number used for paging/voice mail, because the forwarded call is connected directly to a voice mail announcement that explains how to leave a message in the same manner as any answering machine or wireline voice mail service.

5.0

NARROWBAND PCS

The newly auctioned narrowband PCS frequencies allow two-way traffic. The current paging frequencies are only one-way. The new PCS frequencies position the paging industry to generate originating traffic terminating onto the PSTN. Paging carriers will evolve into full service network providers competing openly in the market with cellular, LEC, IXC, and voice mail providers. The DID arrangement currently provides the only gateway to service options for PCS; PIN arrangements will not support these services.

**SUBSCRIBER ACCESS DEGRADATION; INFERIOR DIALING AND
NON-STANDARD ACCESS**

In addition to making impossible or impracticable the provision of various advanced messaging services, the imposition of a PIN technology requirement for toll-free paging services also will place paging providers at a competitive disadvantage with LECs and other providers of messaging services. If the use of PIN technology is required, customers using voice mail services offered by paging carriers would be required to dial 18 digits, while the customers using the voice mail services offered by the LECs and others in the landline and wireless environments would be required to dial only a maximum of 11 digits.

As such, mandatory PIN paging arrangements can be compared to the Carrier Access Code (CAC) requirements that initially were imposed on the non-incumbent Interexchange Carriers. Under the CAC requirement, the caller was required to dial 5 extra digits to access the interexchange carrier network in order to complete long distance calls. The FCC long ago set a precedent on anticompetitive dialing conditions, as stated in the Carrier Access Code ruling involving the IXC's. Regulatory requirements imposed on a segment of the wireless industry, involving additional digits as part of an expanded dialing plan, would be similarly anticompetitive. Only the paging carriers are in a position to determine when PIN paging is a reasonable, competitive, and satisfactory business decision to impose on their subscribers. Any mandatory PIN dialing arrangement will severely hinder the paging industry from fairly competing in the expanding messaging and Personal Communications Services markets because of the burden of dialing additional digits to access the paging system's network.

In addition, the lack of universal access that would result from a mandatory PIN paging arrangement is a significant consideration. Currently, the public can dial from any telephone and be connected to a toll-free service that is accessed on a DID arrangement. PIN interconnection, in contrast, would allow calling from only those telephone devices which have touch-tone capabilities. This would prevent all rotary telephones, some payphones (which block the dialing of additional digits after the initial number) and some calls from foreign countries from using 800 toll-free service. Rotary

telephones still represent a significant portion of the telephones in service today. In a PIN environment, in order to serve rotary phones, a paging carrier would have to offer operator services to which the call would default after a number of seconds if the PIN were not received, increasing costs to paging providers and further undermining their competitiveness.

DID vs PIN – OVERALL NETWORK EFFICIENCY

Although the use of PIN technology in conjunction with toll-free numbers may slow the rate of utilization of special access codes, the use of PIN technology also entails considerable efficiency costs. There are overall network efficiencies gained with DID arrangements that do not exist with PIN methods. All LEC 800 access service rates are based on network usage. PIN dialing arrangements take more network time for completion and are therefore more costly. See Figure 3 for an efficiency comparison of the two methods. The standard DID method is clearly the quickest fashion for completing a call on the PSTN. Furthermore, as a direct result of longer holding times, paging carriers require more equipment and interconnection trunks to handle calls placed in a PIN dialing arrangement. Naturally if the paging carrier needs more equipment, the interconnected LEC will also require the additional complement of equipment. All carriers' networks would have to be built up proportionally to accommodate a PIN-only dialing scheme for paging carriers; the cost of this additional equipment inevitably would be passed on to consumers in the form of higher rates.

DID vs PIN Call Completion Procedures

800 Number DID Call	800 Number PIN Call
1. Caller receives Dial Tone	1. Caller receives Dial Tone
2. Caller enters 1 + 10 digit number	2. Caller enters 1 + 10 digit number
3. Call is routed to a Access Tandem Switch	3. Call is routed to a Access Tandem Switch
4. Access Tandem performs database look-up and routes the call to the appropriate IXC	4. Access Tandem performs database look-up and routes the call to the appropriate IXC
5. IXC performs translation from 800 number to PSTN number	5. IXC performs translation from 800 number to PSTN number
6. IXC routes call to End User Service Provider	6. IXC routes call to End User Service Provider
7. End User Service Provider connects caller to the Service Subscriber (called party)	7. End User Service Provider queries caller for Personal Identification Number (PIN) of Service Subscriber (called party)
8. Call Completion	8. Caller enters PIN
	9. End User Service Provider performs database look-up to identify Service Subscriber

800 Number DID Call	800 Number PIN Call
	10. End User Service Provider connects caller to the Service Subscriber (called party)
	11. Call Completion

**PROHIBITING PERSONAL 800 NUMBER BY PAGING SUBSCRIBERS WILL
BE VERY DIFFICULT TO ENFORCE AND MAY BE WASTEFUL OF
NUMBERING RESOURCES**

After May 1, 1993, when 800 portability became mandatory, the use of "personal" 800 numbers by the public steadily increased. IXC's now regularly offer 800 numbers for subscribers to have toll-free access to their home or business. There are an undetermined number of people who have obtained 800 numbers directly from an IXC, then have that IXC "point" the 800 number to a local DID. That DID could be a home, business, cellular phone, fax, computer modem, etc. It could also be pointed at a DID assigned to a paging unit. The paging carrier has no way of monitoring this type of activity.

In order for a prohibition on personal 800 number use to be effective, it must be ensured that personal 800 subscribers don't simply change providers. If PageCo, for example, stopped selling personal 800 number service, customers who still wanted one could simply secure an 800 number directly from an IXC and point it to a regular geographic paging number. (The IXC would very likely be unaware of where the 800 number was point. Indeed, IXC's are, today, offering 800 numbers that can be redirected by the user instantaneously.) Worse, such a scenario consumes both an 800 number and a local geographic number - TWO numbers to provide the same service that today is provided by a single number.

Eliminating points to paging NXX's would be very challenging. The IXC's would have to maintain databases of valid, current, local paging numbers and prevent their entry into 800 routing databases. This would be additional overhead on service management systems and would also further complicate administration of the North American Number Plan. Further, a truly persistent subscriber might secure yet another local number from the LEC to be used strictly for forwarding to the local paging number. Now, THREE numbers are consumed to provide a single personal 800 number.

The net result of prohibiting personal 800 numbers could be revenue shifting from the paging companies to the IXC's, personal inconvenience to paging subscribers, and greatly increased consumption of numbering resources.

9.0

NANP PLANNING AND NUMBER UTILIZATION

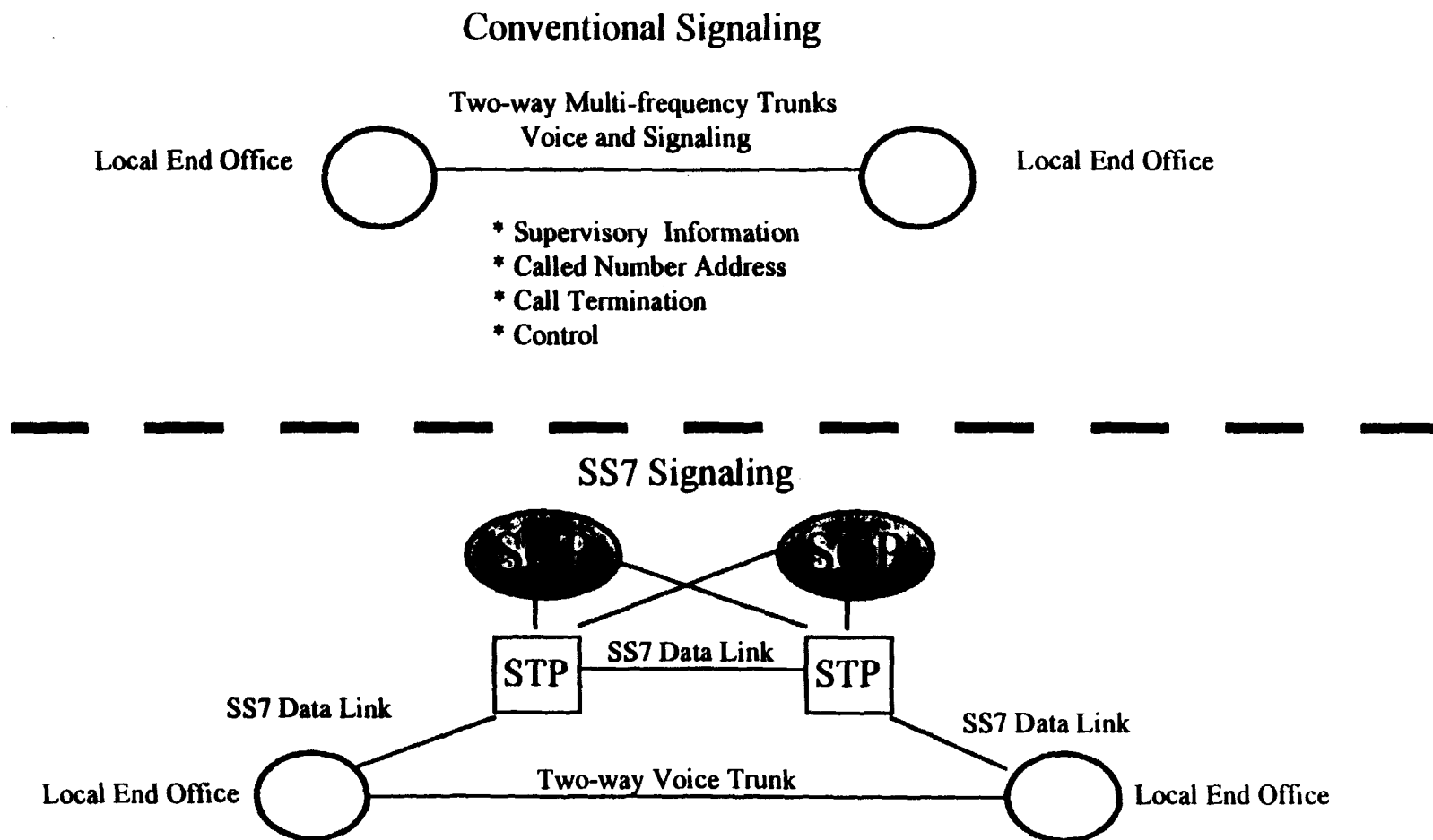
Toll free number resources are plentiful. INC has already allocated 64 million numbers for the 8XX series, which can be available within the same or similar time frames as 888, with proper planning. Further, 16 million additional toll free numbers can be made available through the use of 8XX-0XX and 8XX-1XX sequences. Lastly, with proper network planning any three digit number series can be toll free. The key in each instance is planning and actual implementation of any necessary changes. Clearly, now is the time to systematically lay out a mechanism for determining the sequence of toll free numbers that will be made after the 8XX numbers are utilized, and the methodology by which these numbers will be made available.

CONCLUSION

The public's demand for toll-free based services, including paging, is clearly evident by the popularity of 800-type numbers. Toll-free numbers are perceived universally as the easiest means of accessing a multitude of features while costing the caller nothing. It is therefore a natural conclusion that business users of all sizes would want to be "easy to access" through the use of a toll-free service number. The public wants to be able to access all segments of telecommunications in the easiest possible fashion. The public and competitive pressures also demand that paging providers be able to offer all of the enhanced services that are technically possible. Toll-free services provide all of these features. It is fully expected that the public will resort to creative and wasteful methods to accomplish DID access if toll-free numbers are not made readily available.

PIN-based paging services are technically inferior, less efficient in the use of PSTN network resources, anticompetitive because of the additional dialing requirements and preclude the use of SS7 technology for future paging and PCS enhanced services. For these reasons PCIA is opposed to any restriction or requirement that toll-free number access for paging services be limited to a PIN arrangement for subscriber calling.

Conventional And SS7 Signaling Configurations



Service Control Point (SCP) - Customer Service Description Database

Switching Transfer Point (STP) - Packet switch which transfer SS7 messages between network nodes.

Local End Office - Controls the switching function of the voice circuits. Has SS7 connection to STP.

Figure 1

Voice Mail Systems and DID 800 Numbers

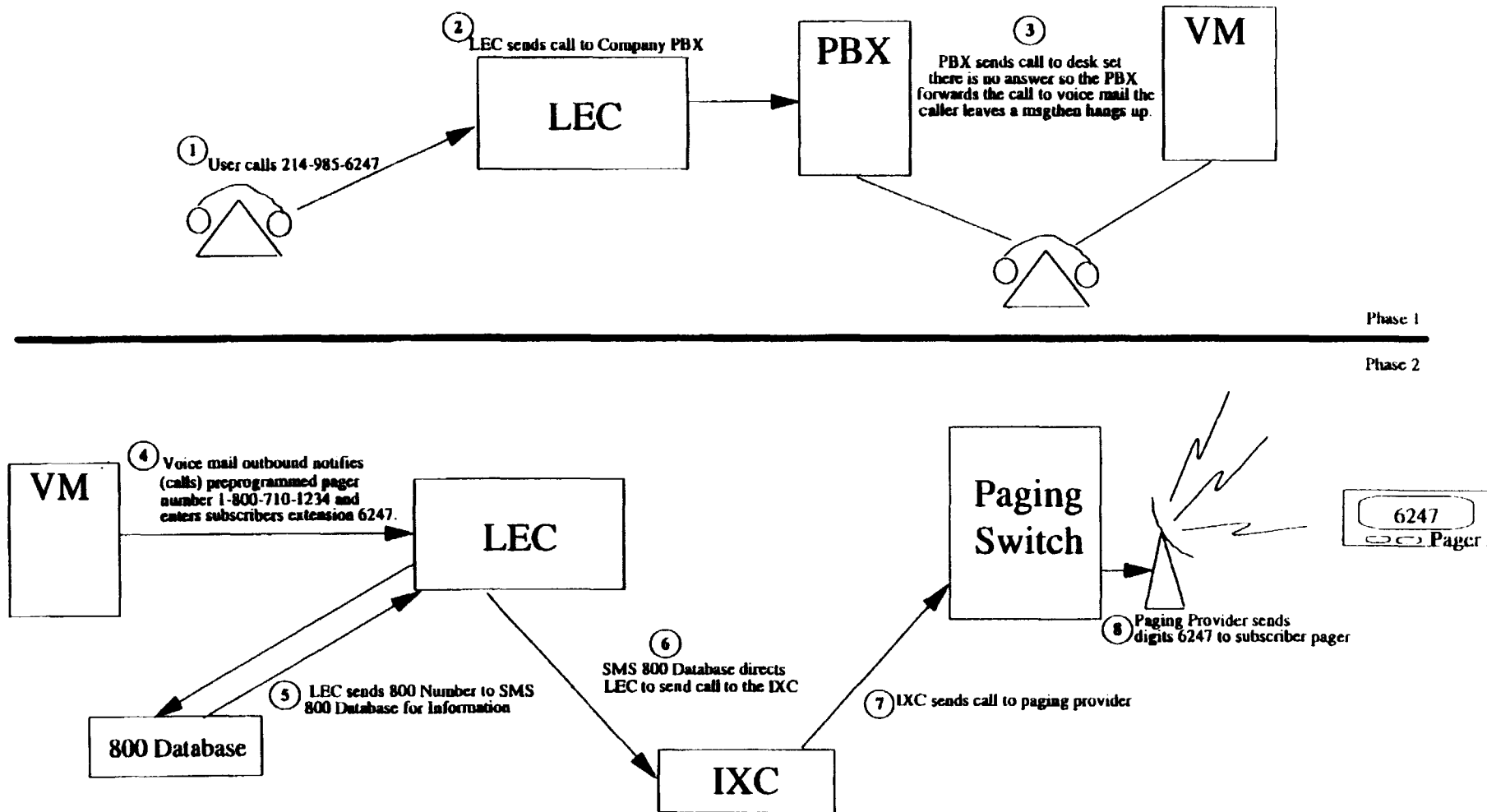


Figure 2

Efficiency Comparision of DID vs PIN 800 Arrangement

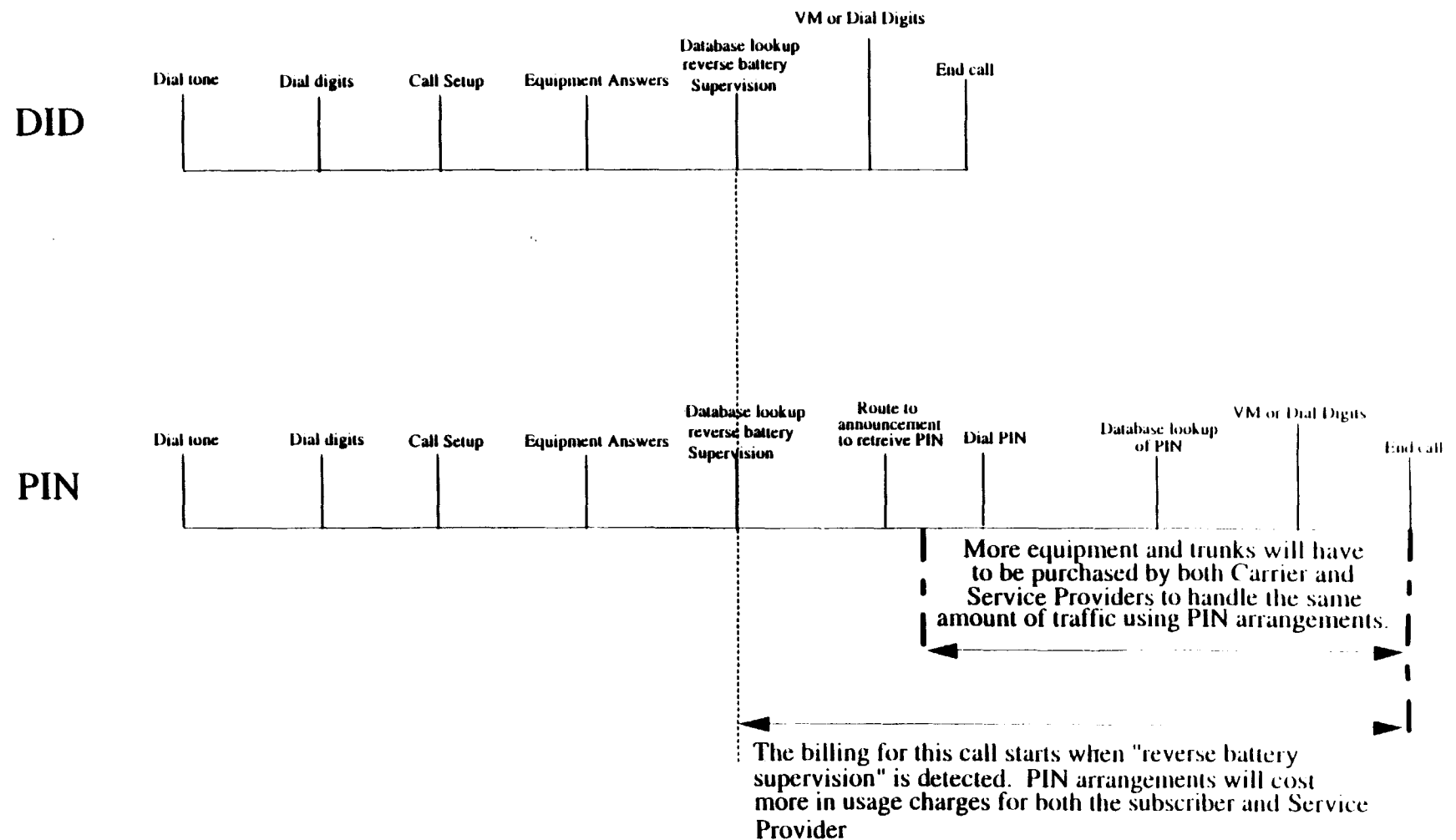


Figure 3